**UNITED NATIONS**

**E**

**Economic and Social Council**

Distr.
GENERAL

E/CN.17/IFF/1998/4
19 June 1998

ORIGINAL: ENGLISH

COMMISSION ON SUSTAINABLE DEVELOPMENT
Intergovernmental Forum on Forests
Second session
Geneva, 24 August-4 September 1998

Programme element II.c

# Matters left pending and other issues arising from the programme elements of the IPF process

# Transfer of environmentally sound technologies to support sustainable forest management

## Report of the Secretary-General

SUMMARY

Following the United Nations Conference on Environment and Development, the international dialogue has considerably enhanced the understanding of sustainable forest management and has accelerated action towards such management by various stakeholders. However, forestry practices in most countries are characterized by being insufficiently aggressive in utilizing available environmentally sound technologies for more efficient production harvesting and processing of wood and non-wood products and for forest conservation. Furthermore, social as well as long-term sustainability aspects have received inadequate consideration to date.

Although better implementation of sound technologies has great potential for enhancing the management, conservation and sustainable development of all types of forests, technology is often not the critical limiting factor, and not every constraint to sustainable forest management can be alleviated by the transfer of technology. Indeed, policy environments favourable to sustainable forest management and the implementation of technologies are as important as the technologies themselves.

98-19280 (E) 040898

/...

In contrast to the intense international policy dialogue, implementation of sustainable forest management has been slow in many countries. This is partly due to insufficient awareness and appreciation of the potential benefits that can be derived from the use of environmentally sound and socially acceptable technologies in the management, conservation and sustainable development of forests to meet present and future needs. There have also been insufficient efforts for the comprehensive assessment of technology generation and needs. Furthermore, many developing countries have weak capacities for assessment of the environmental soundness of available and emerging technologies.

It is suggested that as part of a broader challenge at the national and international levels, the ongoing international forest policy dialogue address the promotion, development and implementation of national forests programmes, including the comprehensive assessment of technology needs, exchange of information and technology transfer. Beyond national forests programmes, there will be a need for sustained international support for capacity-building in technology assessment, information access and the dissemination of sound technologies and equipment for use in forestry. The present report is based on material prepared by the Food and Agriculture Organization of the United Nations, as lead agency for this topic within th· informal high-level Inter-Agency Task Force on Forests.

CONTENTS


| | | Paragraphs | Page |
|---|---|---|---|
| I. | MANDATE AND SCOPE | 1 - 3 | 5 |
| | A. Mandate | 1 - 2 | 5 |
| | B. Scope | 3 | 5 |
| II. | INTRODUCTION | 4 - 8 | 5 |
| III. | OVERVIEW OF THE CONCLUSIONS AND PROPOSALS FOR ACTION OF THE FORMER INTERGOVERNMENTAL PANEL ON FORESTS | 9 - 10 | 6 |
| IV. | CURRENT STATUS OF THE TRANSFER OF ENVIRONMENTALLY SOUND TECHNOLOGIES | 11 - 13 | 7 |
| V. | ASSESSMENT OF RECENT DEVELOPMENTS | 14 - 37 | 7 |
| | A. Forest development policy imperatives | 15 | 8 |
| | B. Range of possible technologies | 16 - 21 | 8 |
| | C. Technology assessment methodology and capacity-building | 22 - 24 | 9 |
| | D. Linkages between research, technology generation, information technology and trade | 25 - 26 | 10 |
| | E. Current trends in North-South technology transfer | 27 | 11 |
| | F. Current trends in South-South technology transfer | 28 - 29 | 11 |
| | G. Technology transfer and diffusion to extension workers, private-sector agents and farmers | 30 | 11 |
| | H. Gender implications of forest-related technology transfer | 31 - 33 | 12 |
| | I. Technologies for the use of wood as an energy source | 34 - 37 | 13 |
| VI. | CONCLUSIONS AND PRELIMINARY PROPOSALS FOR ACTION | 38 - 62 | 13 |
| | A. Forest development policy imperatives | 40 - 41 | 14 |
| | B. Range of possible technologies | 42 - 47 | 14 |
| | C. Assessment of technology generation and needs | 48 - 49 | 15 |

CONTENTS (continued)


| | | Paragraphs | Page |
|---|---|---|---|
| D. | Linkages between research, technology generation and information technology | 50 - 51 | 16 |
| E. | North-South technology transfer | 52 - 53 | 16 |
| F. | South-South and trilateral technology transfer | 54 - 55 | 17 |
| G. | Technology transfer and diffusion through extension workers to private-sector agents and farmers | 56 - 57 | 17 |
| H. | Gender implications | 58 - 59 | 18 |
| I. | Technologies for use of wood as an energy source | 60 - 62 | 18 |

# I. MANDATE AND SCOPE

## A. Mandate

1. At its first session, in October 1997, the Intergovernmental Forum on Forests (IFF) emphasized the need to build on the positive results achieved by the former Intergovernmental Panel on Forests (IPF), and to consider matters left pending and matters arising from the programme elements discussed during the IPF process. The Forum decided that the topic of technology transfer would be discussed under programme element II.c of its programme of work, with the following mandate:

> "Examine ways of promoting, facilitating and financing access to and transfer of environmentally sound technologies and corresponding know-how to developing countries on favourable terms, including concessional and preferential terms, as mutually agreed, taking into account chapter 34 of Agenda 21 and paragraph 11 of the Forest Principles, and examine appropriate mechanisms to effect such access and transfer; consider technologies and technical knowledge, including extension services for local sustainable management, as well as enhanced technology development, transfer and application to improve the utilization of wood and non-wood forest products and services, with special attention to wood as an energy source and to the role of women." (E/CN.17/IFF/1997/4, para. 7, category II (c))

2. The Forum also decided that this issue would receive substantive discussion at its second session. The present report has been prepared with the intention of providing the basis for that discussion.

## B. Scope

3. The present report recalls some of the conclusions and proposals for action contained in the final report of the Intergovernmental Panel on Forests on its fourth session (E/CN.17/IPF/1997/12) that are relevant to transfer of environmentally sound technologies. It also provides a brief overview of the particular problems encountered in transferring technologies that are specific to forests and forest products processing. It describes some of the activities undertaken by some of the major actors in transferring forest-related technologies. The report also contains a brief description of the types of technologies that need to be transferred and the particular mechanisms needed to facilitate this. The report concludes with a set of conclusions and preliminary proposals for action that the Forum may wish to consider.

# II. INTRODUCTION

4. Improved access to and better application of available and emerging technologies would greatly contribute to sustainable management of forests. It is also important, however, to recognize that in many countries, technology is often not the critical limiting factor in enhancing management, conservation and sustainable development. Rather, the status of forestry practice in many

countries is such that major advances can be made in sustainable forest management through improvements in current management practices.

5. Furthermore, there may not necessarily be a technological solution for every problem; not every constraint to sustainable forest management can be alleviated by the transfer of technology. Policy environments favourable to sustainable forest management and the implementation of technologies are as important as the technologies themselves.

6. It is important to stress that all parties need to be cautious about the possible mix of purposes between technology transfer and "technology dumping". Transfer of technology should be driven by needs and not by supply. In addition, the proper use of technologies is critical to their impact on sustainable forest management. Thus, capacity-building of human resources and institutions are critical to the successful transfer of technology.

7. For the world's forests to continue to provide multiple services, their management, conservation and sustainable development must continue to benefit from and take advantage of the most recent relevant technological advances and technical know-how. Technological advances hold great potential for more efficient and sustainable management of forests in many areas. This is common to all countries, developing and developed. The aspects of forestry which stand to benefit the most from technological innovations include (a) forest resource assessment (remote sensing, computer-based geographical information system (GIS) techniques etc.); (b) intensive wood production (biotechnology and breeding); (c) forest harvesting and transport; (d) wood processing and use (saw mill technologies, pulp and paper manufacturing, energy production); and (e) processing and other addition of value to non-wood forest products (fruits, oils, gums, pharmaceutical products etc.).

8. It is important to pursue the IPF proposal that finance and technology be considered interrelated components of investment and international assistance since they are essential for socio-economic development and growth. Traditionally, technology transfer has been a component of development assistance packages for developing countries. In the future, however, the private sector is likely to play a greater role, especially in forest-rich countries, and technology transfer will probably feature more prominently in agreements on trade and environment in relation to forest products and services. Countries with low forest cover are likely to benefit less from private-sector involvement.

## III. OVERVIEW OF THE CONCLUSIONS AND PROPOSALS FOR ACTION OF THE FORMER INTERGOVERNMENTAL PANEL ON FORESTS

9. The former IPF made several proposals for action relevant to technology transfer. It urged countries to primarily assess and explicitly identify their national technological requirements consistent with their national forest programmes. It also promoted South-South, North-South and trilateral cooperation in forest-related technology transfer, and highlighted the importance of access to information and capacity-building in the context of successfully transferring environmentally sound technologies.

10. Following its final session, the Commission on Sustainable Development endorsed the final report of the former IPF and stressed the urgent need for enhanced international cooperation to implement IPF proposals for actions towards the management, conservation and sustainable development of all types of forests, including provision for financial resources, capacity-building, research and the transfer of technology.

## IV. CURRENT STATUS OF THE TRANSFER OF ENVIRONMENTALLY SOUND TECHNOLOGIES

11. Technology for sustainable forest management is understood here in a broad sense, encompassing techniques as well as methods, technical knowledge and information. Therefore, transfer of technology is a component of a wide range of programmes and projects at different levels, ranging from research and scientific information to technical cooperation and extension.

12. Different organizations play different roles in the transfer of environmentally sound technologies to support sustainable forest management. For example, universities and other research and training organizations provide help with the state of knowledge and practice. Public and private organizations have formal and informal linkages for the transfer of such technologies the world over. Multilateral, bilateral and local resource providers include technology transfer and capacity-building components in their support packages. The United Nations and its relevant specialized agencies play a significant role as facilitators of global consensus-building, and assist countries in technology transfer and capacity-building. Many intergovernmental agencies and political and/or economic blocks assist in the transfer and adoption of environmentally sound technologies. In some countries, private industry is active in the development and transfer of technologies. Environmental NGOs are becoming increasingly important advocates for the transfer and adoption of environmentally sound technologies in many parts of the world.

13. There are some opportunities to catalyse and support technology transfer as parts of official bilateral and multilateral assistance programmes for developing countries. The transfer of forest technologies, however, may be constrained by broader policy issues, such as those related to forest harvesting. Some donor agencies have limitations in financing projects dealing with this aspect of forestry unless seen as one of the component of sustainable forest management. It is important that this issue be discussed and resolved mutually by parties engaged in international cooperation for the sustainable management of forests.

## V. ASSESSMENT OF RECENT DEVELOPMENTS

14. The report of the Secretary-General on overall progress achieved since the United Nations Conference on Environment and Development (E/CN.17/1997/2 and Add.1-31) amply summarized the status of recent developments. Although many of the goals of the United Nations Conference on Environment and Development (UNCED) were to be achieved through reliance on environmentally sound technologies, there has been little follow-up action on increased transfer of

available technologies for the sustainable management of forests. It is suggested that IFF address the various facets of this shortfall, as set out below.

## A. Forest development policy imperatives

15. It is important that the promotion of investments in and transfer of environmentally sound technologies, as well as extension activities in general, be addressed in the new generation of forest policies and as part of national forest programmes. Important components of national forest programmes involve the assessment of technology requirements and specific action plans for their access, transfer and development, as well as extension programmes for local capacity-building. It is expected that the new generation of national forest programmes will feature stronger partnerships between the public sector, private sector, and communities in the sustainable management of forests. Through such partnerships, the private sector, if supported by adequate policy environments, will potentially play a bigger role in sustainable forest management and conservation, as well as in forest technology development and transfer, particularly in forest-rich countries.

## B. Range of possible technologies

16. It is instructive to consider developments around the three technology groups identified below:

### 1. Available technologies

17. First, many available technologies in both developed and developing countries could be better utilized for the sustainable management of forests. Examples of available technologies and methods include improved genetic quality of planting material, tree plantation development, and timber harvesting and processing technologies. The success of their transfer and use depend on (a) enabling policy environment, and (b) human capacity development, particularly for developing countries.

18. For these available technologies to be utilized, actions are needed primarily at the national level, with technology transfer playing a relatively small role. However, recent trends in many developing countries indicate that, without targeted and specific assistance, little additional investment in the use of environmentally sound technologies in forest management can be expected from either the public or private sector.

### 2. Technologies needing increased transfer

19. There are many technologies for supporting the sustainable management of forests that are already in use (including in some developing countries) but that have not yet been tested and transferred to other developing countries, such as satellite and GIS-based forest assessment techniques, biotechnology, and

specialized aspects of tree product processing (value addition); these are mostly applied in developed countries only. For some of these recently developed technologies, there is a need for adaptive research on their effective adaptation and application in developing countries. For developing countries to take full advantage of these recently developed technologies for the sustainable management of their forests, additional investments are needed in (a) training, (b) minimal facilities to support use, and (c) operating costs.

20. Two important limitations on the transfer and effective use of this second group of technologies in developing countries need to be specifically addressed: (a) the patent and other intellectual property right issues of technologies (particularly for high-value pharmaceutical and food tree products), and (b) the high costs and difficulties of access to some of these technologies (particularly for satellite-based technologies).

### 3. Emerging technologies

21. There are new and emerging technologies of significant potential value for our understanding, such as technologies concerning the functioning of forest ecosystems, which could contribute to environmentally sound management. Some of these emerging technologies are still at the research and development stage, while others are at an application and testing stage in a few countries; examples of these emerging technologies and methods are genetic engineering and technologies used in assessing functions of forests, such as carbon sequestration. Research indicates that some of these technologies have the potential to revolutionize the way we assess, conserve and enhance the functions and services of forests. Developing countries need to be encouraged and supported to become full partners in ongoing research and development. Partnership in technology research and development will circumvent some of the technology access and transfer problems encountered by developing countries in the past by, for example, greatly reducing the time lag between technology development and its future impact on the sustainable management of forests in developing countries.

## C. Technology assessment methodology and capacity-building

22. In contrast to the development of criteria and indicators for sustainable forest management, little progress has been made on the development of methods for assessing the environmental soundness of forest production and forest product processing technologies. This is an important area that extends into such aspects as sharing the costs of environmental damage, certain aspects of international trade in forest products and technology transfer. The practical starting point is the development of appropriate technology assessment methods by employing certain internationally agreed, objective criteria and indicators. There are examples from other sectors, such as methods applied in assessing agricultural technologies. In any case, the minimum requirement for technology assessment remains the ex ante appraisal of societal and environmental effects of technology application.

23. Developing countries need to address the urgent need for capacity-building in technology assessment and access, within their international forestry cooperation and support programmes, first with a priority focus on better utilization of technologies already available in the country. Second, capacity-building efforts need to focus on methods for assessing technologies earmarked for transfer. Third, capacity-building needs to focus on exposure to and assessment of new and emerging technologies that could enhance the sustainable management of forests in the future. There is a need for technical guidance from specialized bodies with a comparative advantage in capacity-building for sustainable forest management technologies, such as the Food and Agriculture Organization of the United Nations, the International Tropical Timber Organization and the United Nations Industrial Development Organization.

24. Capacity-building efforts could also be better sustained if developing countries, among themselves, developed mechanisms of collaboration and networking to reduce costs and move towards collective self-reliance in their capacities to effectively assess technologies. This is an area where international and regional organizations could promote and support regional training and information networking.

### D. Linkages between research, technology generation, information technology and trade

25. In many countries, forestry research and the generation and transfer of technology are integrated and/or compounded. These linkages are particularly evident where research is supported by the private sector. It should be noted that forestry as practised in many countries today is not adequately utilizing research findings and technological innovations. The issues involving the changing dimensions of forestry science and practice (see para. 21 above) apply equally well to forestry research. These close linkages need to be recognized and treated, as far as possible, as two sides of the same coin. Lack of current information on available technologies and on those under research and development is another important limitation to technology assessment and transfer. Few developing countries have focal points for technology information dissemination and assessment. Information on relevant technological innovations and adaptations in other countries is often not sufficiently targeted for possible assessment. The combination of lack of information and lack of mechanisms/centres for their assessment greatly limits the transfer and adoption of environmentally sound technologies in forest management in developing countries. Pertinent developments in information technology are important prerequisites for technology transfer.

26. In the current more liberalized global trade environment established since the Uruguay Round of multilateral trade negotiations, it is to be expected that countries, in particular developing countries, will seek greater opportunities to benefit from value addition on the products and services from their forests. This is accomplished through increased local processing and through investment in environmentally sound extraction and processing technologies.

## E. Current trends in North-South technology transfer

27. In most cases, industrialized countries place no restrictions on transfer of technologies that are available in the market. Developing countries, however, have yet to develop appropriate mechanisms for their routine access and assessment. Few countries have developed specific investment incentives to promote technology transfer, both on the exporting and receiving ends. A more significant trend in accelerating technology transfer is the growing pressure from powerful environmental non-governmental organizations on private companies in industrialized countries to use cleaner technologies in their operations based in developing countries. The current inertia in the North-South transfer of environmentally sound technologies is such that developing countries need to consider alternative strategies to accelerate the process. A possible strategy would be for developing countries to engage in collective bargaining for technology transfer to their regions.

## F. Current trends in South-South technology transfer

28. Environmentally sound technologies generated in the South are likely to be (a) more accessible, (b) less costly and (c) more appropriate for countries in the South. Clearly, this constitutes a strong case for strengthening South-South cooperation in assessment needs for improved technologies and their transfer among countries and regions. Several initiatives have been started to promote and support technical cooperation among developing countries, which could provide useful platforms for accelerating the transfer of forest technologies. Regional and interregional networks are potentially useful mechanisms for the South-South and trilateral transfer of technologies for sustainable forest management.

29. The role of traditional forest-related knowledge warrants specific consideration in the discussion of transfer and benefit-sharing from derived products. The role of indigenous people and other forest-dependent people living traditional lifestyles should play a key role in this area. The forests are the greatest reservoirs of biodiversity, with species of great value as food, pharmacopoeias and traditional medicine. Examples from African forests include *Ancistrocladus korupensis*, of which some elements have shown promising activities against the human immunodeficiency viruses HIV-1 and HIV-2, and *Prunus africana*, of which elements have been proven to treat prostate cancer. In many cases, in developing countries, where traditional forest-related knowledge has the potential to lead to important breakthroughs, intellectual property right protection does not exist and/or is not enforced. Under such circumstances, there are many unresolved issues on transparency, fair recognition and sharing of benefits upon transfer of knowledge and technology.

## G. Technology transfer and diffusion to extension workers, private-sector agents and farmers

30. To date, international deliberations on forests have given relatively little emphasis to the need for more effective technology dialogue with end beneficiaries, such as extension workers, private-sector agents and farmers in

both developed and developing countries. A few success stories of the transfer of computer-aided woodlot management and woodworking industry technologies to extension workers and private-sector agents have recently been reported in, for example, the United States of America, Finland and Sweden. The transfer and diffusion of technologies to end-users are of particular importance for wood energy technologies, and have the potential to make a significant contribution to sustainable management of forests the world over. Only a few developing countries have taken specific action towards sustained technology transfer and diffusion to the various end-users. Technology transfer and diffusion to end-users are development challenges for most countries, developed and developing, and deserve greater support. Transfer technologies related to worker's safety and health would be of particular importance since many counties have poor legal and technical mechanisms related to forest workers' safety.

## H. Gender implications of forest-related technology transfer

31. Although there are important gender-related issues concerning forest tenure and ownership that need to be resolved, it is fully recognized that the transfer and diffusion of technologies for the use of wood as an energy source have made a significant impact on the quality of life and economic advancement of women in some developing countries. The Nairobi Programme of Action, as adopted by the United Nations Conference on New and Renewable Sources of Energy in 1981, addressed important development challenges, but unfortunately for many developing countries, the needed relief from the burden placed on women, in particular, as fuelwood collectors has not been accomplished.

32. The Fourth World Conference on Women, held at Beijing in 1995, called for an assessment of the implications of any planned action for women and men; this is a process generally known as gender mainstreaming, which has provided an impetus for action to ensure that women not only have access to and training in technology but also participate in the process from development to application, as well as monitoring and evaluation. The Conference also calls for diversification of and increase in vocational and technical training of women and girls in such fields as environmental and technical sciences. The Beijing Platform for Action calls for an increased effort in outreach programmes specifically targeted at low-income women in rural areas for the provision of training and information, as well as credit and investment funds.

33. In many countries, women play a major role in the establishment and management of forests, and are the depository of a large part of forest-related technologies, including traditional forest-related knowledge. Therefore, women are important actors as well as participants in the transfer and application of technologies for sustainable forest management. Women's roles, in all countries, need to be recognized and their participation in sustainable forest management needs to be actively supported. Much greater enrolment by women is needed in some of the traditionally more male-dominated forest-related education and training programmes.

## I. Technologies for the use of wood as an energy source

34. Wood energy technologies deserve special consideration. Chapter 11 of Agenda 21 specifically addresses efficient utilization and assessment to recover the full value of the goods and services provided by forests, forest lands and woodlands. Energy use in the forest and wood sectors has two extremes. On one extreme, technologies for large-scale forest production and wood processing (including pulp and paper manufacture) have energy and waste/pollutant implications of great national and international concerns. On the other extreme, energy-saving wood and charcoal devices in households, particularly in developing countries, have significantly reduced fuelwood demands.

35. Only a small proportion of harvested wood (about one third) ends up in final processed products, such as furniture and paper. The rest of the harvested wood has great potential for supplying a substantial proportion of the world's energy needs. More efficient use of this substantial by-product of wood processing constitutes a shift towards carbon dioxide substitution through use of wood instead of fossil fuel.

36. Already, many medium and large-scale wood processing industries, primarily in developed countries, have made significant attempts to use waste and by-products to generate energy required internally by plants. In developed countries, some manufacturing plants have attained about 30 per cent energy substitution. In contrast, many wood processing plants in developing countries have made few attempts at energy substitution and increased efficient use of energy and wood. In view of the role of forest in environmental and climate stabilization, there is a need for international promotion and facilitation of technology transfer of efficient wood energy technologies, particularly in developing countries with forest products processing industries, targeted at small-scale and medium-scale operations in rural communities.

37. The forest sector in many developing countries is a dominant employer of labour. Forest-sector operations often have greater direct impact on the most economically marginalized rural populations. Wood energy technologies employ about 10 times the labour needed for fossil-energy-based technologies. Furthermore, many developing countries already have access to appropriate technologies for the use of wood as a source of energy, as well as wood collection and transportation. They often lack mechanisms, however, for efficient diffusion of these technologies to rural communities and for household applications. Adoption of wood energy technologies would have significant economic, political and social benefits.

## VI. CONCLUSIONS AND PRELIMINARY PROPOSALS FOR ACTION

38. It should be noted that in several cases, the conclusions and proposals for action set out below are not new but merely reflect a need to focus on particular aspects of the proposals for action of the former IPF in the light of experience gained.

39. Although better implementation of sound technologies has great potential for enhancing the management, conservation and sustainable development of all

types of forests, technology is often not the critical limiting factor, and not every constraint to sustainable forest management can be alleviated by the transfer of technology. Indeed, policy environments favourable to sustainable forest management and the implementation of technologies are as important as the technologies themselves.

## A. Forest development policy imperatives

### Conclusions

40. Currently, most national forest policies do not specifically address the promotion and facilitation of investments in and transfer of environmentally sound technologies in support of sustainable forest management and for forest products industries. Interested partners, in particular the private sector, are expected to play a more prominent role in forest technology development and transfer in the future, particularly in forest-rich countries.

### Preliminary proposals for action

41. IFF may wish to consider:

(a) Including the transfer of environmentally sound technologies and investment promotions in national forest programmes;

(b) Adequate policies to further the participation of interested parties in development and decision-making that affects efficient technology development, transfer and use.

## B. Range of possible technologies

### 1. Available technologies

### Conclusions

42. There are many available technologies in both developed and developing countries that could be better utilized for sustainable management of forests. Better utilization of these available technologies depends primarily on actions at the national levels with technology transfer playing a relatively small role. Developing countries need continued and enhanced international support to better utilize available technologies in forest management.

### Preliminary proposals for action

43. The Forum may wish to consider specific assistance targeted at creating enabling policy environments to facilitate public and private investment in the use of environmentally sound technologies in forest management; and human capacity development.

### 2. Technologies needing increased transfer

Conclusions

44. Many technologies for sustainable forest management are already in use but have not yet been tested and transferred to developing countries. For some of these, there is a need for adaptive research on the limitations of their adaptation and application in developing countries.

Preliminary proposals for action

45. IFF may wish to consider:

(a) Additional investments in developing countries taking full advantage of recently developed technologies through assistance to training and minimal facilities to support their use;

(b) Addressing limitations in the patent and other intellectual property right aspects of technologies (particularly for high-value pharmaceutical and food products), and the high costs and difficulties of access to some of these technologies (particularly for satellite-based technologies).

### 3. Emerging technologies

Conclusions

46. There are new and emerging technologies of significant potential value for our understanding of forest ecosystems functions, that could contribute to environmentally sound management. Partnership in technology research and development will circumvent some of the technology access and transfer problems encountered by developing countries.

Proposals for action

47. The Forum may wish to consider:

(a) Strengthening support of the full participation of developing countries in ongoing research and development;

(b) Proposing ways and means to create partnerships in technology research and development in order to reduce the time gap between development and application.

## C. Assessment of technology generation and needs

Conclusions

48. There have been insufficient efforts for the comprehensive assessment of technology generation and needs. Furthermore, many developing countries have weak capacities for assessment of the environmental soundness of technologies.

Preliminary proposals for action

49. The IFF may wish to consider:

(a) Including comprehensive assessment of technology needs and their transfer as a strong feature in national forests programmes;

(b) Mechanisms for sustained international support for capacity-building in technology assessment, and for the access and dissemination of information on sound technologies and equipment for the management, conservation and sustainable development of all types of forests.

## D. Linkages between research, technology generation and information technology

Conclusions

50. In many countries, technology generation has been initiated and has progressed satisfactorily, mainly through research efforts that address some of the common weaknesses of the transfer process, such as poor coverage, target group bias, high costs, poor and limited information content, and lack of funding. Rapidly advancing information technology continues to play a major role in catalysing technology generation.

Preliminary proposals for action

51. The Forum may wish to consider:

(a) Actions that strengthen and take increased advantage of the linkages between research and technology development of forest and forest-processing technologies, through involving users in research planning;

(b) Ways and means to assess the potential of electronic information systems/information and communication technologies, through developing techniques and methods to further integrate these technologies with ongoing communication and information networks.

## E. North-South technology transfer

Conclusions

52. North-South transfer would need the collaboration and close involvement of the private-sector. It is apparent that there are still many challenges to increased private-sector investment in forestry and forest industry in developing countries, as well as in the transfer of environmentally sound technologies. There are opportunities to catalyse and support North-South technology transfer as parts of official bilateral and multilateral assistance programmes, especially for developing countries with low forest cover. Transfer of forest technologies may be constrained by broader policy issues, such as issues related to forest harvesting, where some donor agencies have limitations

in financing projects dealing with this aspect of forestry unless seen as a component of sustainable forest management.

Preliminary proposals for action

53. The Forum may wish to consider:

(a) Practical ways to promote and support the review of national policies related to investment in the forest sector, particularly incentives to promote the transfer and implementation of environmentally sound technologies;

(b) Urging developed and developing countries to specifically include forest-related technology transfer in assistance packages on terms mutually agreeable to all parties, paying particular attention to countries with low forest cover.

## F. South-South and trilateral technology transfer

Conclusions

54. There are many appropriate technologies already transferred to or generated in the South that could be applied in sustainable forest management, and that are more accessible, less costly and have higher adoption potential compared with technologies from the North.

Preliminary proposals for action

55. The Forum may wish to consider:

(a) Strengthening initiatives that could accelerate the South-South and trilateral transfer of environmentally sound forest and forest products processing technologies, such as programmes on technical cooperation among developing countries and regional or interregional networks;

(b) Mechanisms to realize the potential of transfer and benefits of traditional forest-related knowledge through the development and enforcement of intellectual property rights in developing countries.

## G. Technology transfer and diffusion through extension workers to private-sector agents and farmers

Conclusions

56. To date, relatively little attention has been given to the need for increased technology diffusion to end beneficiaries through extension workers. A few countries have attempted to develop effective mechanisms for the diffusion of appropriate technologies to end-users. These mechanisms have a significant potential to be emulated by a broader set of countries.

Preliminary proposals for action

57. The Forum may wish to consider practical measures to promote and support the timely diffusion of environmentally sound technologies to end-users, particularly in rural communities in developing countries, through the establishment of technology diffusion centres.

## H. Gender implications

Conclusions

58. Much more focused attention should be given to gender mainstreaming related to wood energy use, tree cultivation for household use, forest tenure and ownership, sustainable forest management, and capacity-building and empowerment through access to and transfer of technology. Women's contributions, concerns and experiences must be fully taken into account in planning and implementing forest policies and programmes.

Preliminary proposals for action

59. The Forum may wish to consider:

(a) Steps to ensure opportunities for women, including indigenous and rural women, to participate in forest-related decision-making at all levels;

(b) Ensuring the use of data and information that is desegregated by sex in gender-specific sectoral surveys and studies used in the development of sustainable forest management policies and projects, so that women's rights and roles are fully reflected in decisions;

(c) Strengthening outreach programmes targeted at poor, rural women in the areas of training, small credit, and training and information related to household use of wood, woodlots for fuelwood and cooking technology;

(d) Encourage the training and education of women and girls in energy technologies and cultivation of trees for household use;

(e) Increasing efforts to enrol more women in higher education on forest-related issues, such as forestry, ecology, wood technology, pulp and paper engineering, biology and biotechnology, and chemistry and pharmacology, in both developed and developing countries.

## I. Technologies for use of wood as an energy source

Conclusions

60. There is an urgent need for technological innovations to turn the currently large proportion of waste and by-products in forest logging and wood processing into an environmental good through the use of modern wood energy technologies, which could have significant impact on carbon substitution locally and globally.

Appropriate technologies for the use of wood as an energy source at the rural household level have a great potential to enhance the health and socio-economic status of women in many developing countries.

61. A shift to a reliance on modern wood energy technologies could bring with it quantum increases in employment generation and the redistribution of investment to marginalized rural populations.

Preliminary proposals for action

62. The Forum may wish to consider:

(a) Proposing international action as a logical follow-up to the Montreal Protocol, UNCED and the Kyoto Protocol, urging a shift to modern wood energy technologies as part of addressing the global concerns of carbon sequestration and substitution.

(b) Pursuing concrete actions, to be taken at individual country and forest industry levels, to use energy-efficient technologies as important criteria in assessing the environmental soundness of wood processing technologies.

---